Berry/Vegetable Times
July 2005

UNIVERSITY OF FLORIDA
IFAS EXTENSION

Calendar of Events

Aug. 9 Pesticide License Testing. Hillsborough County Extension Office. Seffner. 9 am. For more information call Dave Palmer, 813-744-5519,ext 103.

Aug.16 &17 Florida Strawberry Growers Association 2005 Agritech Education Session and Trade Show. Arthur Boring Building, Strawberry Festival Grounds, Plant City. For more information contact FSGA, 813-752-6822.

Aug. 25 WPS Train the Trainer, 9:00-4:00. Polk County Agricultural Center, Bartow, Fl. Cost $25. 6 CEUs will be available. For more information call Alicia at 813-744-5519, ext134.

Sept. 7 Tomato Institute, Ritz-Carlton, Naples, 9:00-3:00. Admission free. For more information contact Phyllis Gilreath at 941-722-4524, ext.229.

Sept.13 Pesticide License Testing. Hillsborough County Extension Office. Seffner. 9 am. For more information call Dave Palmer, 813-744-5519, ext 103.

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From Your Extension Agent...

On August 16th and 17th the 2005 Strawberry Agritech Educational Session and Trade Show will be held at the Florida Strawberry Festival Grounds in Plant City. A variety of talks informing growers of the latest regulatory issues and IFAS research trials are slated. Also available will be sets of questions from Citrus and Vegetable magazine CORE CEU articles that have been published so far this year. These articles are sponsored by chemical companies with Bayer being this year's sponsor and the magazine. Articles are written by Extension agents to give growers an easy way to get restricted pesticide license CORE credits. Articles can be found on-line. All you need to do is read the article and answer the questions, then send the completed test to the author of the article to grade. A score of 70 or better is needed to get 1 CORE credit. For a restricted pesticide license to be renewed you now need 4 CORE and 4 private applicator CEUs every 4 years. This is an easy way to get all the question sets in one place and be able to do them at your convenience and meet your pesticide license CORE requirement.

Looking forward to seeing you at Agritech!

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Oberon® Miticide/ Insecticide Approved for Strawberries

Jim Price, Silvia Rondon and Curtis Nagle

The approval by EPA and FDACS for Oberon® 2 SC miticide/insecticide by Bayer CropScience is welcomed since it has proven itself to be an excellent control agent for twospotted spider mites and whiteflies in several years of work at GCREC Dover and Bradenton. Oberon's ® spiromesifen active ingredient represents a new mode of action (inhibitor of lipid synthesis) and new class of compound (cyclic tectronic

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acids) for strawberries and can be a good rotational partner with other miticides of diverse modes of action.

Oberon® is a non-systemic, contact pesticide active against spider mite eggs and all the other developmental stages; however immature mite stages are most susceptible. In addition to control of twospotted spider mites, it controls immature whiteflies, emerging pests of strawberries. It cannot be used in greenhouses in Florida.

Oberon® is compatible with Florida's strawberry culture. The pre-harvest interval (PHI) is 3 days, field re-entry interval (REI) is 12 hours, and three applications may be made per crop season at as close as 7 day intervals. Treated areas can be planted back immediately to fruiting vegetables, leafy vegetables and cucurbits, which include most of the second crops that traditionally follow strawberries in the Plant City area.

The label carries a "Caution" precautionary statement and product will be available in time for the 2005-06 strawberry season. We look forward to integrating this additional miticide into our strawberry culture.

Hillsborough County Extension Service Factsheet 05-2

Required Workplace Posters

P. R. Gilreath and A. J. Whidden, May, 2005
(Source: Florida Fruit & Vegetable Association, Florida Strawberry Grower's Association)

The following are posters which should be posted at the work site. Most can now be downloaded and printed from the websites listed. Phone numbers are also included for additional information. Please note that FFVA and FSGA does provide some posters for their members. This list also includes some optional posters and information on the WPS poster.

The following six posters can be printed from the Poster Page of the U.S. Department of Labor at http://www.dol.gov/osbp/sbrefa/poster/main.htm (Or call 1-866-USWAGE or 1-866-487-9243)

- **Family & Medical Leave Act** - Needed if you hire 50 or more people at any one time during the year within a 50 mile radius.
- **Fair Labor Standards Act** - Federal Minimum Wage. You must now have the **state poster** as well. It is not available online but should be available from your commodity organization and the law goes into effect May 2, 2005.
- **Job Safety & Health Protection** - OSHA Health & Safety.
- **The Law: Equal Employment Opportunity Commission**.
- **MSPA - Migrant & Seasonal Worker Protection Act**.
- **Uniformed Services Employment and Reemployment Rights Act.** (A new poster)
- **Unemployment Compensation** (From your insurance carrier)**W**
- **Workers' Compensation** (get this from your carrier - broken arm poster)
- **Florida Human Relations Commission.** http://fchr.state.fl.us (Tallahassee, 850-488-7082 or 1-800-342-8170 for voice messaging) This poster not available online. Call the commission for a copy.
- **Florida Child Labor** (needed only if anyone under 18 is hired) (FL Dept of Labor, Tallahassee, 850-488-3131) http://www.state.fl.us/dbpr/pro/childlabor/poster.shtml
- **Tractor Decals** (Spanish and English, side-by-side) (These are available from FFVA to members only. This is supposedly related to an OSHA Training requirement, although when I called OSHA , they did not have it on their list of required posters.)
- **Protect Yourself from Pesticides** (EPA WPS Poster) (Can be ordered from Gempler's along with other WPS materials at 1-800-382-8473) www.gemplers.com
- **WH-516** (this is not a poster, but a MSPA disclosure statement that you can post. Optional)

http://www.dol.gov/esa/forms/whd Form_WH-516_English.PDF

New Molecular-Genetic Resources for Strawberry Research

Kevin Folta, Molecular Biologist
Horticultural Sciences Dept., University of Florida

Despite its value as a crop plant, relatively little is known about the molecular mechanisms that affect strawberry form and function. Most of what is understood comes from studies of model plant systems such as *Arabidopsis thaliana*, a laboratory-friendly weed species with a sequenced genome, rapid life cycle, and compact growth habit. Gene constructs may be easily added, and public repositories of mutants are extensive. Arabidopsis has taught us much about processes important to plant growth and development, yet has no direct relevance to agriculture.

The current challenge to researchers is to translate the wealth of fundamental information from the model systems into studies in species of interest. Molecular-genetic endeavors have characterized genes involved in critical plant processes (flowering, disease, fruit development) in many crop species. Hundreds of thousands of fruit-crop gene sequences have been obtained from citrus, peach, apple, grape and many other species. But, relatively little comparable research has been performed in strawberry.

Research directives at the University of Florida's Horticultural Sciences Department seek to correct the dearth of information in cultivated strawberry. Newly-developed resources have expanded the public databases and present new research tools that promise to speed development of molecular markers for genetic mapping, the discovery of new genes important to strawberry (and other species) and expand the understanding of plant traits critical to efficient production in today's challenging conditions.

The first resource is a database of Expressed Sequence Tags (ESTs) and Simple Sequence Repeats (SSRs) from strawberry. In early 2004 only 54 strawberry gene sequences existed in the public domain. Generous funding from the North American Strawberry Growers Association and the Horticultural Sciences Department funded the production of an EST library, a collection of sequences from expressed genes. Over 1800 genes were sequenced, analyzed and immediately deposited to public databases. The results of these analyses are presented in a recent report in *BMC- Plant Biology* (5:12). Briefly, genes sequences associated with control of photoperiodic flowering, disease, stress, and general metabolism have been isolated from strawberry, and now serve as a basis to test gene function. Comparisons were made to genes isolated from other plants in the rose

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The Laboratory Festival #9 genetic line is a promising tool for development of transgenic plants for strawberry research. A 1cm petiole is removed from the plant, sterilized with bleach and placed onto media containing a specific combination of growth regulators (top left). Within days changes in cell identity and growth are observed (bottom left panel; left side of petiole segment). After 35 days in culture the petiole segment produces tens to hundreds of shoots, each a clone of the parental line (middle panel). The panel on the right shows a juvenile plant in culture after approximately 90 days.

family, suggesting a short list of strawberry specific genes. With this basic parts list, it is now possible to test what was learned from Arabidopsis and other model systems in strawberry. The SSRs have been used as molecular markers, allowing integration of gene sequences of known function onto the strawberry genetic linkage map.

The other new tool is the LF9 genetic line. LF9 stands for "Laboratory Festival #9" a plant produced from a 'Strawberry Festival' self-pollination, selected in the laboratory for robust growth in culture. This plant line readily accepts bacterial insertion of new genes, allowing for studies of gene function. The LF9 line has attracted great interest from the Rosaceae (rose family) research community as it represents a vehicle to finally test the role of specific genes in a Rosaceae background on the scale of months instead of years. The most tangible roles for this line lie in the creation of strawberry lines harboring mis-expressed genes of interest. These studies promise to add resolution to understanding the molecular mechanisms associated with photoperiodic flowering, fruit ripening, yield, disease resistance and a host of other agriculturally-relevant traits.

The EST database and the LF9 genetic line represent only two of emerging technologies that will facilitate translation of new molecular-genetic paradigms to cultivated strawberry. The current research goals are to create a means to understand gene function, map genes in the cultivated strawberry background, and then implement use of transgenic (gene insertion) tools and new genetic markers to assist in cultivar improvement. Such technologies promise to assist breeders, growers and the industry adjust to changes in policy and practice with even greater speed and agility.

Recent Experiments Yield New Ideas: Comparing Strawberry Varieties

Jim Mertely, Craig Chandler, and Natalia Peres

Last season, several field experiments were carried out in Dover to find better ways to control strawberry diseases. Some of our findings were surprising. Results from our most recent variety trial are summarized in this article.

In October 2004, five strawberry cultivars were planted in a replicated field trial at Dover. The five cultivars were Camino Real, Condonga, Strawberry Festival, Sweet Charlie, and Ventana. The experimental area was tractor sprayed weekly throughout the season with a low rate of Captan 80WP (1 7/8 lb in 100 gal/A) to maintain a minimal level of disease control. During the early season, plots were harvested regularly, but no data was taken. Fruit from the ripening between February 21 and March 31 were harvested twice weekly, and graded to determine marketable yield, weight of marketable berries, and the percent of fruit infected by anthracnose, Botrytis, and powdery mildew:

Yields of marketable fruit were highest for Festival and Ventana, and lowest for Sweet Charlie. While no early season data was taken, Ventana started fruiting later and was probably out-produced by Festival in December and January. Many Sweet Charlie plants in this trial were stunted and reddish from the onset due to infection by Strawberry Mild Yellow Leaf and possibly other viruses. In addition, Sweet Charlie is an early season cultivar which typically "plays out" in March when most yield data from this trial was gathered.

As expected, the California cultivars Camino Real and Ventana produced larger, heavier fruit than the Florida cultivars Festival and Sweet Charlie. The Spanish cultivar Condonga also produced larger fruit, although many had green shoulders during the cooler parts of the season.

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Environmental conditions from January to March 2005 encouraged the development of Botrytis fruit rot, but suppressed the spread of anthracnose. Nevertheless, the incidence of anthracnose fruit rot was sufficient to demonstrate the high resistance of Sweet Charlie to this disease. In addition, Festival proved more resistant to anthracnose than Ventana, but not significantly more resistant than Camino Real. Festival was also moderately resistant to Botrytis, while Camino Real and Ventana lost large numbers of fruit to Botrytis fruit rot. Powdery mildew typically appears on the foliage early in the season and on the fruit later on. In our trial, the powdery mildew fungus grew conspicuously on the seeds of some Condonga and Sweet Charlie fruit, but occurred less frequently on Camino Real, Festival, and Ventana.

	Yield	Fruit wt	Percent fruit			
Cultivar	(lb/A)	(g/fruit)	culls	Anthracnose	Botrytis	Mildew
Camino Real	12,500 b	22.6 a	46.7 b	6.3 bc	37.6 d	0.5 a
Condonga	12,000 b	22.3 ab	45.5 b	6.2 bc	13.8 a	11.0 c
Strawberry Festival	15,000 a	16.7 c	33.3 a	3.6 b	13.3 a	1.8 ab
Sweet Charlie[b]	6,700 c	16.0 c	67.4 c	0.5 a	17.5 b	10.5 c
Ventana	15,300 a	21.1 b	51.8 b	9.7 c	32.4 c	2.4 b

Application Considerations for Reduced Rates of Methyl Bromide with VIF and Metalized Mulch Film in Vegetable Production

James P. Gilreath, GCREC-Balm
Phyllis R. Gilreath, Manatee County Extension Service
Bielinski Santos, GCREC-Balm

The amount of methyl bromide in 350 lb. of a 67:33 methyl bromide:chloropicrin (w:w) formulation is about 235 lb. of actual methyl bromide. This rate of 235 lb. of methyl bromide per treated acre (field rate) is thought to be the lowest rate for maintaining good nutsedge control under typical application conditions. This is based on use of methyl bromide with standard low or high density polyethylene (ldpe or hdpe, respectively) film mulch which has low retention capacity for methyl bromide.

Over the past 6 years, considerable research has been conducted with virtually impermeable films (VIF) which have much higher fumigant retention capacity compared to ldpe and hdpe. Research and grower trials with tomato and pepper have established that methyl bromide rates can be reduced by one-half with VIF products and still maintain nutsedge control and crop yields comparable to those achieved with a full rate with standard film. Unfortunately, there are 2 drawbacks to most VIF products: cost and handling characteristics. Today, all VIF is made in Europe and must be imported, thus resulting in much higher cost than standard film. Also, most VIF products are more difficult to lay than standard films in that they are prone to linear sheer under too much tension. Handling characteristics among VIF materials differ significantly, but all are based on polyamides, such as nylon, for their barrier properties and these polyamides do not stretch well. Also, none are embossed at the present time.

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In the past 2 years, we have examined the barrier properties of metalized films under field conditions, first with Inline and more recently with methyl bromide. In each case, application of Inline or methyl bromide in conjunction with metalized film greatly increased the retention of the fumigant. In the case of methyl bromide, nutsedge control was obtained with 175 lb/acre of 67:33 under Canslit metalized film that was equal or superior to that obtained with the full 350 lb/acre rate under standard ldpe or hdpe film in each of four experiments. Grower trials confirmed these results. The retention of methyl bromide and resultant nutsedge control with Canslit metalized film was similar to what we obtained with VIF at every rate of methyl bromide, ranging from 88 to 350 lb/acre of 67:33.

While it is possible to use VIF or Canslit metalized film to reduce methyl bromide rates by one-half, successful use involves more than just reducing gas flow and laying mulch film. Methyl bromide has a high vapor pressure, which means that at typical application temperatures it rapidly becomes a gas and can do so even within the tubing and gas knives. This is an advantage for reduced rate application, but does not solve one inherent problem - uniformity of application. Typical gas rigs employ 3 knives per bed. A good fumigation job requires that all 3 knives deliver the same amount of product per minute so the application rate is uniform in the area being fumigated. When the rate is reduced, there is less fumigant in the system and more opportunity for the formation of bubbles as the methyl bromide "boils." This "boiling" easily can be visualized by inserting small sight glasses in the application equipment at the flow divider just ahead of the tubes which carry the fumigant to the knives (Fig. 1). Under normal conditions, a certain amount of back pressure exists in the application system and can be measured at the flow divider by installing a pressure gauge. Application of a full 350 lb/acre rate will generate in excess of 30 psi of back pressure at this point. Reducing the methyl bromide flow rate to deliver lower rates per acre will reduce the back pressure measured at the flow divider. Our experience indicates that back pressure below 15 psi results in nonuniform distribution to the three knives which means inequalities in rate across the bed. Usually the edges suffer the most and this can be observed later in the season as poor nutsedge control on bed shoulders.

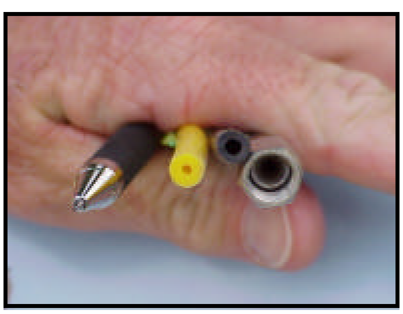

Fig. 1. Various diameter tubing for fumigant delivery to chisels.

To increase back pressure when using low rates of methyl bromide or any other fumigant, you must decrease the flow capacity of the delivery system between the flow divider and the gas knives. This can be accomplished in two ways. First, you can use a smaller diameter tubing to deliver fumigant to the gas knives. Standard gas rigs use inch inside diameter tubing. We have found the use of poly tubing ranging from 1/16 to 1/8 inch inside diameter is necessary to achieve balanced or uniform delivery of greatly reduced rates of methyl bromide. Tubing of this size is not readily available, but can be obtained and is an important modification for using reduced rates of methyl bromide with a highly retentive film. Fine tuning of flow capacity or rate of any tube can be accomplished by increasing or decreasing the length of the tube connecting the flow divider to the gas knife. There is some amount of friction loss within any size tube which increases with increased length and decreased tubing inside diameter. Typical length for 1/16 and 1/8 inch tubing is 5 ft, although longer tubing has been used when trying to achieve really low rates. Color coded tubing is available which can be a big help when adjusting flow rates. Yellow tubing has the thickest walls and smallest inside diameter of 1/16 inch. Black tubing is available in 1/8 inch inside diameter (Fig. 2). These tubes all fit the same size connector, making it easy to switch from one flow capacity to another. Select the tube needed for the desired flow capacity; once installed, adjust the flow regulator valve for the required flow rate on the flow meter.

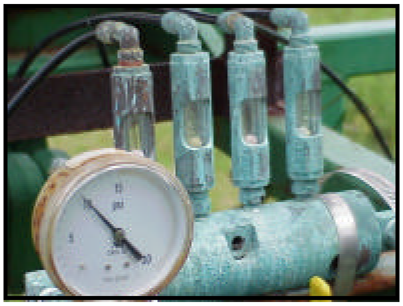

Fig. 2. Flow divider with sight glasses and pressure gauge.

A second way to decrease flow and increase back pressure is to use orifice plates (Teejet ® flow regulators) in the tubing at the top of the gas knife fitting. To use these plates, you have to know what flow rate you need in each tube. Since the flow rates of orifice plates are based on water, you have to do some mathematical conversions to methyl bromide or choose one on the high side and try it. Do not use a plate with the exact same flow rate as desired; a slightly higher flow rate is necessary so that clogging potential is lowered. The plates are stamped with numbers that indicate the size of the hole in the plate (Fig. 3). It is recommended to keep a supply of various sizes on hand. Orifice plates work over a more narrow range of rates than tubing does, because the restriction in flow occurs at one point rather than over a length of tubing.

The system we use is commercially available (manufactured by Mirruso Enterprises, Inc., available through Chemical Containers, Inc.) and constitutes an easily installed, simple modification. It consists of a flow divider with a small sight glass for each knife, a 0 to 30 psi pressure gauge and small diameter poly tubing. The sight glasses are equipped with standard quick connect (insert friction connectors) couplings on top so the poly tube can be connected and disconnected easily. Similar couplings are located on the top of the gas knives. Sight glasses allow you to monitor flow and detect plugging of chisels or lines. Plugging can be a significant issue with low rates of fumigant; thus, fumigant filtration is important and filters must be checked periodically and maintained free of debris to assure consistent flow.

When using reduced rates of fumigant, the flow rate has been greatly diminished so accuracy and uniformity of delivery are critical. A common observation on commercial farms is tractor movement as soon as the fumigant flow valve is opened. There is a much longer delay in supplying all the knives uniformly when the rate is reduced, so tractor movement should not begin until all lines are fully charged. This condition can be easily monitored by observing the sight gauges and back pressure gauge. Once the back pressure stabilizes, fumigation can begin. Addition of an inline check valve at the top of each gas knife can be beneficial because it diminishes loss of fumigant out of the line to the knife. By keeping the line full all the way to the gas knife, there are fewer delays in fumigant delivery and less time wasted purging air from lines. This would be especially important for those growers who use radar controlled fumigant delivery systems.

Rate reduction with methyl bromide works when combined with a highly retentive mulch film like VIF or metalized film. In addition to the use of the right film, success requires close monitoring, assuring not only the correct rate, but also uniform delivery to all three knives in the bed. Nonuniformity guarantees poor fumigant performance at any rate, but with reduced rates of methyl bromide, the results can be even more dramatic. The simple modifications described above can greatly improve uniformity of delivery and performance. These modifications are relatively inexpensive and are readily available as a package. Before trying rate reductions, growers should modify their fumigation equipment to allow better control over uniformity of flow. This can mean the difference between success and failure.

Selectivity of Spinosad (Spintor®) Questioned

Chemically Speaking June 2005

Pesticide levels previously thought to be safe for pollinators may prove harmful to wild bee health, according to research published in May's *Pest Management Science*. The Canadian study shows that adult bumble bees exposed to the pesticide spinosad during larval development—at environmentally relevant concentrations—have impaired foraging ability. Bees are important pollinators of crops. In developed countires, approximately a third of human food is reliant on pollinating activity. Wild bees are thought to contribute significantly to this effort.

Although many pesticides are known to be toxic to bees, toxicity testing is largely restricted to direct lethal effects on adult hony bees, if tested on bees at all. Sub-lethal effects on honey bees could be going unnoticed, and other bee species could be differentially affected. Lora Morandin and collegues at Canada's Simon Fraser University tested the effects of different levels of spinosad on bumble bee colony health and foraging ability. Bee colonies were fed the pesticide in a manner that mimicked contact in an agricultural setting. Adult bees and developing larva were exposed to spinosad in pollen. The bees foraging ability on an array of "complex" artificial flowers made of centrifuge tubes was then evaluated. High levels of spinosad residues (about 10 times what bees should experience in the environment) caused rapid colony death. Colonies exposed to more realistic levels of spinosad in pollen did not show any acute effects and only minimal immediate colony effects. However, bees that were fed realistic levels of spinosad during larval development were slower foragers. They took longer to access complex flowers, resulting in longer handling times and lower foraging rates. The bees also displayed "trembling", which impaired their ability to land on the flowers and enter the flower tubes. This impaired foraging ability in bumble bees could result in weaker colonies and lower pollination of crop plants, according to Morandin. "Adult bees that have been exposed to a pesticide during larval development may display symptoms of poisoning that are not detected with current tests required by regulatory agencies." (Society of Chemical Industry 5/6/05).

Pesticide Registration and Actions

Chemically Speaking June and May 2005

?? On April 8, the FDACS issued the Special Local Needs registration SLN FL-05001 to Syngenta for Switch® fungicide (cyprodinil + fludioxonil). The registration is for a reduction in plant back restriction (from 12 months to 30 days) for plants not on the label. Plants on the label can be planted anytime after the last application. (FDACS PREC Agenda, 5/5/05.)

?? The EPA has approved a specific exemption for the use of thiophanatemethyl (Topsin M®) fungicide for management of white mold (*Sclerotinia sclerotiorum*) on fruiting vegetables (tomato, pepper, eggplant). The exemption runs from April 8, 2005 to April 7, 2006. (FDACS letter of 4/14/05).

?? Based on a request by Bayer CropScience tolerances are approved for the insecticide spiromesifen. This is a spirocyclic phenyl-substituted tetronic acid that is effective against whiteflies and mites, with juvenile stages more severely affected. Tolerances of importance to Florida include cotton, seed, strawberry, tomato paste, brassica